

INVESTIGATION 4

PURPOSE

To investigate some of the mechanical properties of the two phases of the NiTi alloy and to relate these properties to the structures of these phases.

PROCEDURE

Part I

- a. Try gently bending each of the two rods provided by your instructor into a V-shape. Identify the rod that is inflexible.
- b. Cool the less flexible rod in liquid nitrogen or an alternative cooling bath (CAUTION), as directed by your instructor. Use tongs and gloves.
- c. Remove the rod from the liquid nitrogen or alternative cooling bath. Then, while wearing gloves, bend the rod into a V-shape.
- d. Allow the rod to warm back to room temperature.

Part II

- e. Warm the flexible rod in water that has been heated to near the boiling point. Remove with tongs, and, while wearing gloves, try to bend it.
- f. Allow the rod to cool and then try to bend it again.

Part III

- g. Using the appropriate methods, return both rods to their original linear shapes.
- h. Try scratching each rod with the other.

FOLLOW-UP QUESTIONS

1. State your observations for step (a) of the procedure.
2. State your observations for step (d) of the procedure.
3. State your observations for step (e).
4. State your observations for step (f).
5. State your observations for step (g).
6. State your observations for step (h).

7. Based upon your observations, which rod was in the low temperature martensite phase and which was in the high temperature austenite phase?

8. a) Which rod was harder than the other?

b) Is this consistent with your answer to question (5)? Explain.

9. If you were to make a pair of eye-glass frames that could be easily restored to their original shape if accidentally sat upon:
 - a) In which phase would you manufacture them?

 - b) Where would you adjust the transition temperature- above or below room temperature?

 - c) If your glasses were bent, what, if anything, would you do to return them to their original shape? Explain.

 - d) What if they didn't fit exactly right? What would you need to do to adjust them?